SUMMARY BY HEXADECIMAL OPCODE

00	NOP	2E	XCH A,R6
01	undefined	2F	XCH A,R7
02	OUTL BUS, A	30	XCHD A,@R0
03	ADD A, #data	31	XCHD A,@R1
04	JMP (Page 0)	32	JB1
05	EN I	33	undefined
06	undefined	34	CALL (Page 1)
07	DEC A	35	DIS TCNTI
08	INS A, BUS	36	JT0
09	IN A,P1	37	CPL A
0A	IN A,P2	38	undefined
0B	undefined	39	OUTL P1,A
0C	MOVD A,P4	3A	OUTL P2,A
0D	MOVD A,P5	3B	undefined
0E	MOVD A,P6	3C	MOVD P4,A
0F	MOVD A,P7	3D	MOVD P5,A
10	INC @R0	3E	MOVD P6,A
11	INC @R1	3F	MOVD P7,A
12	JB0	40	ORL A,@R0
13	ADDC A,#data	41	ORL A,@R1
14	CALL (Page 0)	42	MOV A, T
15	DIS I	43	ORL A,#data
16	JTF	44	JMP (Page 2)
17	INC A	45	STRT CNT
18	INC R0	46	JNT1
19	INC R1	47	SWAP A
1A	INC R2	48	ORL A,R0
1B	INC R3	49	ORL A,R1
1C	INC R4	4A	ORL A,R2
1D	INC R5	4B	ORL A,R3
1E	INC R6	4C	ORL A,R4
1F	INC R7	4D	ORL A,R5
20	XCH A,@R0	4E	ORL A,R6
21	XCH A, @R1	4F	ORL A,R7
22	undefined	50	ANL A,@R0
23	MOV A, #data	51	ANL A,@R1
24	JMP (Page 1)	52	JB2
25	EN TCNTI	53	ANL A,#data
26	JNT0	54	CALL (Page 2)
27	CLR A	55	STRT T
28	XCH A,R0	56	JT1
29	XCH A,R1	57	DA A
2A	XCH A,R2	58	ANL A,R0
2B	XCH A,R3	59	ANL A,R1
2C	XCH A,R4	5A	ANL A,R2
2D	XCH A,R5	5B	ANL A,R3

SUMMARY BY HEXADECIMAL OPCODE (Cont.)

5C	ANL A,R4	89	ORL P0,#data
5D	ANL A,R5	8A	ORL P1,#data
5E	ANL A,R6	8B	undefined
5F	ANL A,R7	8C	ORLD P4,A
60	ADD A,@R0	8D	ORLD P5,A
61	ADD A,@R1	8E	ORLD P6,A
62	MOV T, A	8F	ORLD P7,A
63	undefined	90	MOVX @R0,A
64	JMP (Page 3)	91	MOVX @R1,A
65	STOP TCNT	92	JB4
66	undefined	93	RETR
67	RRC A	94	CALL (Page 4)
68	ADD A,R0	95	CPL F0
69	ADD A,R1	96	JNZ
6A	ADD A,R2	97	CLR C
6B	ADD A,R3	98	ANL BUS,#data
6C	ADD A,R4	99	ANL P1, #data
6D	ADD A,R5	9A	ANL P2, #data
6E	ADD A,R6	9B	undefined
6F	ADD A,R7	9C	ANLD P4,A
70	ADDC A,@R0	9D	ANLD P5,A
71	ADDC A,@R1	9E	ANLD P6,A
72	JB3	9F	ANLD P7,A
73	undefined	A0	MOV @R0,A
74	CALL (Page 3)	A1	MOV @R1,A
75	ENT0 CLK	A2	undefined
76	JF1	A3	MOVP A,@A
77	RR A	A4	JMP (Page 5)
78	ADDC A,R0	A5	CLR F1
79	ADDC A,R1	A6	undefined
7A	ADDC A,R2	A7	CPL C
7B	ADDC A,R3	A8	MOV R0,A
7C	ADDC A,R4	A9	MOV R1,A
7D	ADDC A,R5	AA	MOV R2,A
7E	ADDC A,R6	AB	MOV R3,A
7F	ADDC A,R7	AC	MOV R4,A
80	MOVX A,@R0	AD	MOV R5,A
81	MOVX A,@R1	AE	MOV R6,A
82	undefined	AF	MOV R7,A
83	RET	B0	MOV @R0,#data
84	JMP (Page 4)	B1	MOV @R1,#data
85	CLR F0	B2	JB5
86	JNI	B3	JMPP @A
87	undefined	B4	CALL (Page 5)
88	ORL BUS,#data	B5	CPL F1
		B6	JF0

SUMMARY BY HEXADECIMAL OPCODE (Cont.)

B7	undefined	DC	XRL A,R4
B8	MOV R0,#data	DD	XRL A,R5
B9	MOV R1,#data	DE	XRL A,R6
BA	MOV R2,#data	DF	XRL A,R7
BB	MOV R3,#data	E0	undefined
BC	MOV R4,#data	E1	undefined
BD	MOV R5,#data	E2	undefined
BE	MOV R6,#data	E3	MOVP3 A,@A
BF	MOV R7,#data	E4	JMP (Page 7)
C0	undefined	E5	SEL MB0
C1	undefined	E6	JNC
C2	undefined	E7	RL A
C3	undefined	E8	DJNZ R0,addr
C4	JMP (Page 6)	E9	DJNZ R1,addr
C5	SEL RB0	EA	DJNZ R2,addr
C6	JZ	EB	DJNZ R3,addr
C7	MOV A,PSW	EC	DJNZ R4,addr
C8	DEC R0	ED	DJNZ R5,addr
C9	DEC R1	EE	DJNZ R6,addr
CA	DEC R2	EF	DJNZ R7,addr
CB	DEC R3	F0	MOV A,@R0
CC	DEC R4	F1	MOV A,@R1
CD	DEC R5	F2	JB7
CE	DEC R6	F3	undefined
CF	DEC R7	F4	CALL (Page 7)
D0	XRL A,@R0	F5	SEL MB1
D1	XRL A,@R1	F6	JC
D2	JB6	F7	RLC A
D3	XRL A,#data	F8	MOV A,R0
D4	CALL (Page 6)	F9	MOV A,R1
D5	SEL RB1	FA	MOV A,R2
D6	undefined	FB	MOV A,R3
D7	MOV PSW, A	FC	MOV A,R4
D8	XRL A,R0	FD	MOV A,R5
D9	XRL A,R1	FE	MOV A,R6
DA	XRL A,R2	FF	MOV A,R7
DB	XRL A,R3		

For further information, please refer to
MCS-48 Assembly Language Programming Manual,
98-255 and the MCS-48 Microcomputer User's Manual.

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MCS-48™ Assembly Language Reference Card

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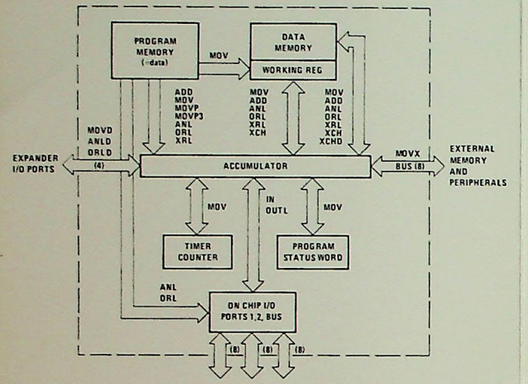
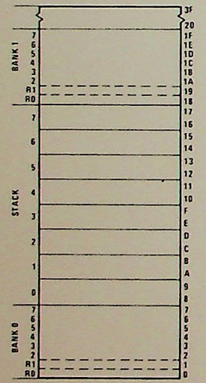
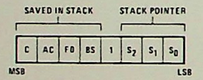
MCS-48™ DATA TRANSFER INSTRUCTIONS



DATA RAM

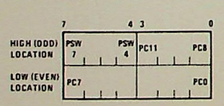


PROGRAM STATUS WORD (PSW)



C CARRY
AC AUXILIARY CARRY
F0 FLAG 0
BS REGISTER BANK SELECT

STACK FORMAT



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ACCUMULATOR

•	ADD A,R_r	6•
•	ADD A,@R0	60
	R1	61
•	ADD A,#data	03
•	ADDC A,R_r	7•
•	ADDC A,@R0	70
	R1	71
•	ADDC A,#data	13
	ANL A,R_r	5•
	ANL A,@R0	50
	R1	51
	ANL A,#data	53
	ORL A,R_r	4•
	ORL A,@R0	40
	R1	41
	ORL A,#data	43
	XRL A,R_r	D•
	XRL A,@R0	D0
	R1	D1
	XRL A,#data	D3
	INC A	17
	DEC A	07
	CLR A	27
	CPL A	37
	RL A	E7
•	RLC A	F7
	RR A	77
•	RRC A	67
•	DA A	57
	SWAP A	47

DATA MOVES

	MOV A,R_r	F•
	MOV A,@R0	F0
	R1	F1
	MOV A,#data	23
	MOV R_r, A	A•
	MOV @R0,A	A0
	R1,A	A1
	MOV R_r,#data	B•
	MOV @R0,#data	B0
	R1,#data	B1
	XCH A,R_r	2•

DATA MOVES (Cont.)

	XCH A,@R0	20
	R1	21
	XCHD A,@R0	30
	R1	31
	MOV A,PSW	C7
•	MOV PSW,A	D7
	MOVX A,@R0	80
	R1	81
	MOVX @R0,A	90
	R1,A	91
	MOVP3 A,@A	E3
	MOVP A,@A	A3

REGISTER

	INC R_r	1•
	DEC R_r	C•
	INC @R0	10
	R1	11
	DJNZ R_r, addr	E•

FLAGS

•	CLR C	97
•	CPL C	A7
	CLR F0	85
	CPL F0	95
	CLR F1	A5
	CPL F1	B5

BRANCH

JMP addr	†4
JMPP @A	B3
DJNZ R_r,addr	E•
JC addr	F6
JNC addr	E6
JZ addr	C6
JNZ addr	96
JT0 addr	36
JNT0 addr	26
JT1 addr	56
JNT1 addr	46
JF0 addr	B6
JF1 addr	76
JTF addr	16

• = Carry Flag Affected
* = See Table 1
: = See Table 2
† = See Table 3

Table 1. Register Accumulator.

R_r	MOV A,R	MOV R,A	XCH A,R	MOV R, #DATA	INC R	DEC R	DJNZ R	ADD A,R	ADDC A,R	ANL A,R	ORL A,R	XRL A,R
R0	F8	A8	28	B8	18	C8	E8	68	78	58	48	D8
R1	F9	A9	29	B9	19	C9	E9	69	79	59	49	D9
R2	FA	AA	2A	BA	1A	CA	EA	6A	7A	5A	4A	DA
R3	FB	AB	2B	BB	1B	CB	EB	6B	7B	5B	4B	DB
R4	FC	AC	2C	BC	1C	CC	EC	6C	7C	5C	4C	DC
R5	FD	AD	2D	BD	1D	CD	ED	6D	7D	5D	4D	DD
R6	FE	AE	2E	BE	1E	CE	EE	6E	7E	5E	4E	DE
R7	FF	AF	2F	BF	1F	CF	EF	6F	7F	5F	4F	DF

BRANCH (Cont.)

JNI addr	86
JB0 addr	12
JB1 addr	32
JB2 addr	52
JB3 addr	72
JB4 addr	92
JB5 addr	B2
JB6 addr	D2
JB7 addr	F2

TIMER

MOV A,T	42
MOV T,A	62
STRT T	55
STRT CNT	45
STOP TCNT	65
EN TCNTI	25
DIS TCNTI	35

CONTROL

EN I	05
DIS I	15
SEL RB0	C5
SEL RB1	D5
SEL MB0	E5
SEL MB1	F5
ENT0 CLK	75

SUBROUTINE

CALL addr	†4
RET	83
RETR	93

NO OP

NOP	00

INPUT/OUTPUT:

IN A,P1	09
OUTL P1,A	39
ANL P1,#data	99
ORL P1, #data	89
IN A, P2	0A
OUT L P2, A	3A
ANL P2, #data	9A
ORL P2,#data	8A
INS A, BUS	08
OUTL BUS, A	02
ANL BUS, #data	98
ORL BUS, #data	88
MOVD A,Pp	0:
MOVD Pp,A	3:
ANLD Pp,A	9:
ORLD Pp,A	8:

ASSEMBLER OPERATORS

(,)
*, /, MOD, SHL, SHR
+, -
EQ, LT, LE, GT, GE, NE
NOT
AND
OR, XOR
HIGH, LOW

• = Carry Flag Affected
* = See Table 1
: = See Table 2
† = See Table 3

Table 2. Input/Output.

Port	IN	OUT	AND	OR
BUS	08	02	98	88
P1	09	39	99	89
P2	0A	3A	9A	8A
P4	0C	3C	9C	8C
P5	0D	3D	9D	8D
P6	0E	3E	9E	8E
P7	0F	3F	9F	8F

Table 3. Branch.

Page	JMP	CALL
0	04	14
1	24	34
2	44	54
3	64	74
4	84	94
5	A4	B4
6	C4	D4
7	E4	F4

Page = 256 bytes

ASSEMBLER DIRECTIVES

ORG	Origin
END	End program
DB	Define Byte
DS	Define Storage
DW	Define Word
IF, ELSE	Conditional Assembly
ENDIF	End Conditional
EQU, Set	Set Symbol Value
MACRO	Define Macro
ENDM	End Macro
LOCAL	Define Local Symbol
REPT	Define Repeat Block
IRP	Indefinite Repeat
IRPC	Indefinite Repeat Character
EXITM	Alternate Macro Exit

HEX-ASCII TABLE

00	NUL		2B	+	56	V	
01	SOH		2C	'	57	W	
02	STX		2D	–	58	X	
03	ETX		2E	.	59	Y	
04	EOT		2F	/	5A	Z	
05	ENQ		30	0	5B	[	
06	ACK		31	1	5C	\	
07	BEL		32	2	5D	]	
08	BS		33	3	5E	^	(↑)
09	HT		34	4	5F	—	(←)
0A	LF		35	5	60	`	
0B	VT		36	6	61	a	
0C	FF		37	7	62	b	
0D	CR		38	8	63	c	
0E	SO		39	9	64	d	
0F	SI		3A	:	65	e	
10	DLE		3B	;	66	f	
11	DC1	(X-ON)	3C	<	67	g	
12	DC2	(TAPE)	3D	=	68	h	
13	DC3	(X-OFF)	3E	>	69	i	
14	DC4	~~(TAPE)~~	3F	?	6A	j	
15	NAK		40	@	6B	k	
16	SYN		41	A	6C	l	
17	ETB		42	B	6D	m	
18	CAN		43	C	6E	n	
19	EM		44	D	6F	o	
1A	SUB		45	E	70	p	
1B	ESC		46	F	71	q	
1C	FS		47	G	72	r	
1D	GS		48	H	73	s	
1E	RS		49	I	74	t	
1F	US		4A	J	75	u	
20	SP		4B	K	76	v	
21	!		4C	L	77	w	
22	"		4D	M	78	x	
23	#		4E	N	79	y	
24	$		4F	O	7A	z	
25	%		50	P	7B	{	
26	&		51	Q	7C	|	
27	'		52	R	7D	}	(ALT MODE
28	(		53	S	7E	~	
29	)		54	T	7F	DEL	(RUB OUT
2A	*		55	U			